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within a range of from 0.001 to 10 % by weight based on the total weight of the ink.

8. (Amended) The ink-jet recording method according to any one of Claims 5 to 7, wherein inks of plural colors of at least cyan, magenta and yellow are used as the pigment inks.

Please add new Claim 9 as follows.

--9. (New) The ink-jet recording method according to Claim 8, wherein step (iii) comprises the sub-steps of applying the cyan ink, magenta ink and yellow ink respectively and forming a full-color image on the recording medium.--

REMARKS

Claims 1-9 are pending in this application, with Claims 1 and 5 being independent. Claims 1-8 are amended herein to more clearly recite the subject matter therein, the specification is amended to improve its form, and Claim 9 is newly added. Support for new Claim 9 can be found in the specification at least at page 5, lines 2-10. Applicants respectfully submit that no new matter has been added by the amendments herein.

Claims 1-4 were rejected under 35 U.S.C. § 112, second paragraph, as allegedly indefinite. Claims 5-8 were rejected under 35 U.S.C. § 112, second paragraph, as allegedly incomplete.

Without conceding the propriety of any part of these rejections, Claims 1-8 are amended herein, without narrowing their scope. It is submitted that the claims comply with all aspects of Section 112, and withdrawal of these rejections is respectfully requested.

Claims 1-8 were rejected under 35 U.S.C. §103(a) as allegedly obvious over Eguchi, et al. (U.S. Patent No. 6,342,289) in view of Kato, et al. (U.S. Patent No. 5,538,549). Applicants respectfully request reconsideration of this rejection.

Before addressing the merits of the rejection, Applicants believe it will be helpful to review some features and advantages of the present invention. The present invention, as recited in independent Claim 1, relates to an ink-jet recording system comprising a recording medium and an ink-jet printing apparatus comprising ink containers in which a plurality of pigment inks are contained, and ink-jet heads for ejecting the respective pigment inks towards the recording medium. The recording medium is provided with a porous layer as an ink-receiving layer on a base material, the porous layer comprising alumina hydrate particles and resinous binder, and having a pore volume of 0.1 to 1.0 ml/g. Each of the pigment inks comprises pigment particles and a resin in an aqueous medium. In each of the pigment inks, the diameter of the pigment particles falls within a range of from 10 to 500 nm, and the proportion of the

pigment particles having a diameter of 300 to 500 nm based on the total number of pigment particles in the ink is at most 30%. Independent Claim 5 relates to an ink-jet recording method of comparable scope.

Some of the advantages of the claimed ink-jet recording system and method are that when a plurality of pigment inks are applied to a recording medium to record a full-color image (in which case, the total amount of the ink applied is large), the ink is well-absorbed and images having excellent properties such as rub-off resistance can be obtained. This is demonstrated in Table 2 (page 38), which shows the results obtained from the Examples and Comparative Examples. The recording mediums of Comparative Examples 1 and 2 are out of the scope of the present invention. Regarding Comparative Examples 3, 4 and 5, magenta ink 3, yellow ink 4 and magenta ink 4 respectively are out of the scope of the present invention. In Comparative Example 1, saturation of the image was found to be poor, although rub-off resistance was good, while Comparative Examples 2-5 all gave poor rub-off resistance. In Applicants' view, the cited references do not teach or suggest the claimed invention.

The Examiner states that Eguchi et al. discloses an ink containing a pigment and a resin in an aqueous medium. Applicants respectfully disagree. Although the specification says "coloring material (dye or pigment)" at col. 8, lines 52-53,

all further discussion relates to dyes. The Examiner also states that Eguchi et al. discloses use of cyan (C), magenta (M) and yellow (Y) pigment inks. Applicants note, however, that the Examples of Eguchi et al. merely state that the printer has nozzles for ejecting four inks of Y, M, C and Bk colors, and that only a black ink containing a dye is used in the Examples of Eguchi et al.

The Examiner acknowledges that Eguchi et al. does not teach certain features of the presently-claimed ink, such as pigment particle diameter, proportion of pigment particles having a diameter in a certain range, and amount of resin in the pigment ink, but takes the position that it would have been obvious for a person skilled in the art to incorporate such features in view of Kato et al. Applicants note, however, that Kato et al. does not teach or suggest the technical problem addressed by the present invention, namely, the influence of a recording medium on recording quality when using a pigment ink, especially when using a plurality of pigment inks. Applicants submit that neither Kato et al. nor Eguchi et al. teaches or suggests anything that would motivate a person skilled in the art to select the pigment ink of Kato for use on the recording medium of Eguchi et al., and hence, it is not proper to combine these references.

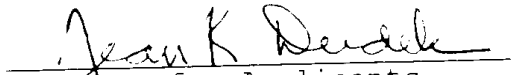
Applicants conclude that the cited references do not anticipate or render obvious the claimed invention, and respectfully request that the Section 103 rejection be withdrawn.

Applicants submit that the present invention is patentably defined by independent Claims 1 and 5 for the reasons discussed above. The dependent claims are also submitted to be patentable for the same reasons and because they set forth additional aspects of the present invention. Individual consideration of each dependent claim is requested.

Applicants request favorable reconsideration, withdrawal of all rejections and early passage to issue of the above-identified application.

Applicants' undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should continue to be directed to our below-listed address.

Respectfully submitted,



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VERSION WITH MARKINGS TO SHOW CHANGES TO THE SPECIFICATION

The paragraph starting at page 1, line 11 and ending at line 23 has been amended as follows.

--With the advent in recent years of color printers and the development of software [softwares] for personal computers [computer], which are [is] capable of processing color images [in recent years], there is an increasing demand for providing higher-definition full-color images. Therefore, developments of high-resolution printing heads, special media for ink-jet, which are high in glossiness, whiteness degree and absorbency, etc. are advancing [advanced] rapidly. Since an ink-jet printing system is a non-contact printing system, [any plate making] plate-making is not required, and high-speed printing becomes feasible. Therefore, the ink-jet printing system is expected to be used in an increasing number [in a field] of industrial applications.--

The paragraph starting at page 1, line 24 and ending at page 2, line 8 has been amended as follows.

--Many attempts to use pigments as coloring materials for inks in ink-jet recording have been recently made. The reason [for it] is that [the] pigments are the best materials

for imparting fastness properties such as water fastness and light fastness in an ink-jet system. Such ink-jet inks using such pigments are disclosed as water-based pigment inks satisfying basic properties such as print quality, ejection stability, shelf stability, resistance to clogging and fixing ability in Japanese Patent Application Laid-Open Nos. 2-255875, 6-99656, 4-57859 and 4-57860.--

The paragraph starting at page 2, line 19 and ending at page 3, line 11 has been amended as follows.

--However, since most of such ink-receiving layers for ink-jet recording have been developed as special media <u>for</u> [to] ink-jet printers using the conventional dye inks, <u>their</u> suitability for pigment inks is not considered. In glossy media in particular, a <u>highly-absorbable</u> [high-absorbable] water-soluble resin is often used as a main component for their ink-receiving layers. Such an ink-receiving layer involves a disadvantage that the ink-receiving layer itself has no water resistance, namely, that even when a pigment with good water resistance is used, the pigment <u>runs</u> [is run] out together with the ink-receiving layer, since the ink-receiving layer is soluble in water. Further, in an image portion formed with the pigment ink, a problem of rub-off resistance, more specifically, a problem <u>arises</u> that when the image portion is touched or rubbed with a finger, the color of the image is simply faded, or

the image is stained [arises]. This phenomenon is particularly marked at a mixed-color portion of the color image in which the amount of inks applied is increased.--

The paragraph starting at page 3, line 12 and ending at line 18 has been amended as follows.

--As a current means for solving such a problem as described above, [it is conducted to subject] the whole surface of the recording medium with the color image <u>is subjected</u> to a <u>post-treatment</u> [post treatment] such as a laminating treatment. However, such a treatment is not always satisfactory from the viewpoints of cost, workability and the like, and it is desired that it shall be improved.--

The paragraph starting at page 3, line 19 and ending at page 4, line 23 has been amended as follows.

--Some proposals have been made on ink-jet recording media for pigment inks. For example, Japanese Patent Application Laid-Open No. 9-123593 discloses that ink-jet recording is conducted with pigment inks on a <u>highly-absorbable</u> [high-absorbable] water-soluble receiving layer provided on a porous layer of alumina hydrate as an ink-jet recording medium for pigment inks. However, water among components of the pigment inks applied is absorbed [up to] <u>into</u> the porous layer

of alumina hydrate, but pigments themselves are fixed to the water-soluble resin layer which is the uppermost layer. Therefore, such a problem of water fastness as described above remains unsolved after all. Japanese Patent Application Laid-Open No. 10-119422 discloses that ink-jet recording is conducted with pigment inks on a carboxylated SBR resin layer provided on a porous layer containing alumina hydrate or silica. Since the carboxylated SBR resin layer is an ink-receiving layer with good affinity for non-aqueous inks, satisfactory suitability for water-based pigment inks is not to be expected [expectable]. Japanese Patent Application Laid-Open No. 10-67168 discloses that a porous layer containing silica or alumina is provided on a base material (cellulose paper, synthetic paper or the like) having porosity, and ink-jet recording is conducted with pigment inks thereon. However, the structure of the base material is limited to that having porosity in which liquid components in the inks can be absorbed. In addition, image properties when a full-color image, in which the amount of inks applied increases, is recorded, particularly, rub-off resistance at an image portion, and the like are not known.--

The paragraph starting at page 7, line 8 and ending at line 16 has been amended as follows.

--In order to improve adhesion to the ink-receiving layer, the surface of the base material may be subjected to a surface treatment such as a corona discharge treatment, or an easy-adhesion layer may be provided as an undercoat [under coat] on the surface. Further, a curl-preventing layer such as a resin layer or a pigment layer for preventing curling may be provided on the back surface of the base material or at a desired position thereof.--

The paragraph starting at page 9, line 9 and ending at line 17 has been amended as follows.

--In the case of a pigment ink in particular, the [a] pigment is present in a state of a great number of particles having a particle diameter distribution, unlike a dye. Therefore, causing [to cause] these pigment particles to penetrate voids in the ink-absorbing layer to some extent becomes a [an] useful means for improving the rub-off resistance. Even from this point of view, it is strongly desired that the pore volume shall be at least 0.1 ml/g.--

The paragraph starting at page 9, line 18 and ending at line 27 has been amended as follows.

--The BET specific surface area of the ink-receiving layer is preferably within a range of from 20 to 450 m^2/g. If

the BET specific surface area is smaller than the lower limit of the above range, sufficient glossiness may not be achieved in such an ink-receiving layer, and its haze may increase, so that an image formed thereon may tend to have [wear] a white haze. If the BET specific surface area is greater than the upper limit of the above range, such an ink-receiving layer may readily undergo cracking [become easy to cause cracks] in some cases.--

The paragraph starting at page 10, line 10 and ending at line 20 has been amended as follows.

--The alumina hydrate is preferably in the form of porous particles, and the particle diameter thereof is preferably 20 to 500 nm. If alumina hydrate having a particle diameter smaller than the lower limit of the above range is used, the resulting ink-receiving layer may become cracked easily [easy to cause cracks] in some cases. If alumina hydrate having a particle diameter greater than the upper limit of the above range is used, the surface smoothness of the resulting ink-receiving layer is lowered, and an optical image formed thereon may become whitish as a whole in some cases.--

The paragraph starting at page 11, line 23 and ending at page 12, line 9 has been amended as follows.

--If the lowest film-forming temperature or the glass transition temperature is higher than the upper limit of either of the above ranges, [each range] on the other hand, problems such as deformation of the base material may arise in a heating and drying temperature range necessary for sufficient film formation. More specifically, film-forming ability by fusion bonding among emulsion particles is lowered in drying (under heat) at a low temperature at which the base material is not deformed, which may cause such problems that cracking occurs on the resulting ink-receiving layer, and pores having a large diameter are formed, so that an image formed on the ink-receiving layer tends to have [wear] a white haze as a whole.--

The paragraph starting at page 12, line 10 and ending at line 20 has been amended as follows.

--On the other hand, the particle diameter of the resin particles dispersed in the emulsion preferably falls within a range of, for example, from 0.07 to 0.7 μm. If the particle diameter is smaller than the lower limit of the above range, the formation of good pores may not be achieved in some cases. If the particle diameter is greater than the upper limit of the above range on the other hand, the diameter of pores formed becomes too large, which may cause a problem that an

image formed on the resulting ink-receiving layer tends to have [wear] a white haze as a whole.--

The paragraph starting at page 15, line 12 and ending at line 27 has been amended as follows.

--If pigment particles having a particle diameter greater than 500 nm are present at such a level as to be detected by a general particle diameter distribution meter, or pigment particles having a particle diameter ranging from 300 to 500 nm are present in a proportion higher than 30% based on the total number of particles of the pigment, such pigment particles are unlikely [become hard] to penetrate into voids in the porous ink-receiving layer of the recording medium used in the present invention, so that the amount of the pigment particles remaining on the surface of the ink-receiving layer is increased. As a result, a problem of rub-off resistance that when an image formed on the ink-receiving layer with such an ink is lightly touched or rubbed with a finger, the color of the image is faded, or the image is stained, becomes recognizable.--

The paragraph starting at page 16, line 1 and ending at line 14 has been amended as follows.

--In the water-based pigment inks according to the present invention, a resin component is contained. The problem

of the rub-off resistance that occurs due to the causes [occurred by such a cause as] described above is improved by defining the preferred particle diameter of the pigment particles in the present invention. However, it is impossible to make all the pigment particles penetrate into voids under any conditions. Therefore, a sufficient effect may not be always achieved in some cases. Accordingly, the resin component having film-forming ability for fixing the pigment is contained in an ink in the present invention to fix the pigment remaining on the surface of the ink-receiving layer by this resin after drying.--

The paragraph starting at page 18, line 3 and ending at line 15 has been amended as follows.

--In the present invention, the resin component described above is preferably contained within a range of from 0.001 to 10 % by weight [mass] based on the total weight of the ink. If the content is lower than 0.001 % by weight, the improving effect on rub-off resistance may be made small because the formation of a film by such a resin becomes insufficient. If the content is higher than 10 % by weight, the viscosity of the resulting ink becomes extremely high, so that normal ejection of ink droplets from a recording head may become difficult in some cases. The preferable content of the resin component is within a range of from 0.005 to 5 % by weight.--

The paragraph starting at page 20, line 21 and ending at page 21, line 2 has been amended as follows.

--The water-based pigment inks of plural colors according to the present invention comprise the pigment and dispersing agent described above and an aqueous medium for dispersing them therein. A preferable aqueous medium used in this case is water or a mixed solvent of water and a water-soluble organic solvent. The content of water in the inks used in the present invention is within a range of generally from 20 to 90 % by weight [mass], preferably from 30 to 70 % by weight [mass].--

The paragraph starting at page 21, line 3 and ending at line 15 has been amended as follows.

--Water-soluble organic solvents usable in combination with water in the present invention may be divided into the following three groups. Namely, they are solvents of the first group, which are high in moisture retention, difficult [hard] to be evaporated and excellent in hydrophilicity; solvents of the second group, which have organicity and good wettability with a hydrophilic surface and also have dryability by evaporation; and solvents [solvent] of the third group, which have moderate wettability and a low viscosity. In the present invention, the

solvent may be suitably selected from among these solvents as necessary for the end application intended.--

The paragraph starting at page 23, line 6 and ending at line 9 has been amended as follows.

--The total amount of such water-soluble organic solvents as described above is within a range of generally from 5 to 40 % by weight [mass] based on the total weight [mass] of the ink.--

The paragraph starting at page 24, line 11 and ending at line 17 has been amended as follows.

--The present invention will hereinafter be described more specifically by the following Examples. However, the present invention is not limited to these examples. Incidentally, proportions and all designations of "part(s)" or "%" as will be used in the following examples are expressed by weight [mass] unless expressly noted.--

The paragraph starting at page 35, line 6 and ending at line 16 has been amended as follows.

--Bubble-jet cartridges for yellow, magenta and cyan inks having 128 nozzles at 360 dpi were charged with the inks of the respective colors used in the Examples and Comparative

Examples and installed in a BJ-W 7000 printer (manufactured by Canon Inc.). A full-color image formed by the yellow, magenta and cyan colors and mixed colors thereof was recorded on the recording medium used in each of the Examples and Comparative Examples to evaluate the inks and recording media as to the following items paying attention to the mixed color portions in particular.--

The paragraph starting at page 37, line 5 and ending at line 5 has been amended as follows.

--The evaluation results are [were] shown in Table 2.--

VERSION WITH MARKINGS TO SHOW CHANGES TO THE CLAIMS

1. (Amendment) An ink-jet recording system [which employs an ink-jet recording apparatus] comprising:

a recording medium; [recording-medium-holding part for a recording medium having an ink-receiving layer on a base material and an ink-holding part for a pigment inks to record an image on the ink-receiving layer of the recording medium fed from the recording-medium-holding part using the pigment ink fed from the ink-holding part,]

an ink-jet printing apparatus comprising ink containers in which a plurality of pigment inks are contained, and ink-jet heads for ejecting the respective pigment inks towards the recording medium,

wherein [(1) the ink-receiving layer of] the recording medium is provided with a porous layer as an ink-receiving layer on a base material, the porous layer comprising alumina hydrate particles and [a resin] resinous binder, the porous layer having [and has] a pore volume [ranging from] of 0.1 to 1.0 ml/g; and

[(2) the] wherein each of the pigment inks [ink] comprises [an aqueous medium, a resin and a] pigment particles and a resin in an aqueous medium, and in each of the pigment inks, the [particle] diameter of the pigment particles

[substantially] falls within a range of from 10 to 500 nm, and the proportion of the pigment particles having a [particle] diameter of 300 to 500 nm [is at most 30%] based on the total number of [particles of the] pigment particles in the ink is at most 30%.

2. (Amended) The ink-jet recording system according to Claim 1, wherein the ink-receiving layer has a BET specific surface area [of the ink-receiving layer falls] within a range of from 20 to 450 m^2/g.

3. (Amended) The ink-jet recording system according to Claim 1, wherein the content of the resin [contained] in the pigment ink is within a range of from 0.001 to 10 % by weight [mass] based on the total weight [mass] of the ink.

4. (Amended) The ink-jet recording system according to any one of Claims 1 to 3, wherein inks of plural colors of at least cyan, magenta and yellow are used as the pigment inks [ink].

5. (Amended) An ink-jet recording method comprising the steps of: [conducting ink-jet recording on]

(i) providing a recording medium [having] provided with a porous layer as an ink-receiving layer [on a base material using a pigment ink to form an image, wherein (1) the ink-receiving layer is a porous layer] comprising alumina hydrate particles and resinous [and a resin] binder on a base material, the porous layer having [and has] a pore volume [ranging from] of 0.1 to 1.0 ml/g; [and]

[(2) the pigment ink comprises an aqueous medium, a resin and a pigment](ii) providing an ink-jet recording apparatus comprising ink containers in which a plurality of pigment inks are contained, and ink-jet heads for ejecting the respective pigmented inks towards the recording medium, each of the pigment inks comprising a pigment and a resin in an aqueous medium, and in each of the pigment inks, the particle diameter of the pigment [substantially falls] falling within a range of from 10 to 500 nm, and the proportion of the pigment particles having a particle diameter of 300 to 500 nm [in the pigment is at most 30%] based on the total number of the pigment particles in the ink being at most 30%[of the pigment]; and

(iii) applying at least one of the pigment inks to the recording medium.

6. (Amended) The ink-jet recording method according to Claim 5, wherein the ink-receiving layer has a BET specific

surface area [of the ink-receiving layer falls] within a range of from 20 to 450 m^2/g.

7. (Amended) The ink-jet recording method according to Claim 5, wherein the content of the resin [contained] in the pigment ink is within a range of from 0.001 to 10 % by weight [mass] based on the total weight [mass] of the ink.

8. (Amended) The ink-jet recording method according to any one of Claims 5 to 7, wherein inks of plural colors of at least cyan, magenta and yellow are used as the pigment inks [ink].

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